THE INSTITUTE SPOKESMAN

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NATIONAL LUBRICATING GREASE INSTITUTE

VOLUME X • NUMBER 11 • FEBRUARY 1947

President Hobart Appoints N.L.G.I. Committees For the Year

In the January issue President Hobart's assignments to the Executive, Finance, Membership, New Activities, Policy and Coordinating, Program, and Publicity, and Advertising Committees were shown.

The personnel of the Technical Committee listed here completes the appointments:

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The INSTITUTE SPOKESMAN

Published monthly by

THE NATIONAL LUBRICATING GREASE INSTITUTE

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4638 Millcreek Parkway
Kansas City 2, Mo.

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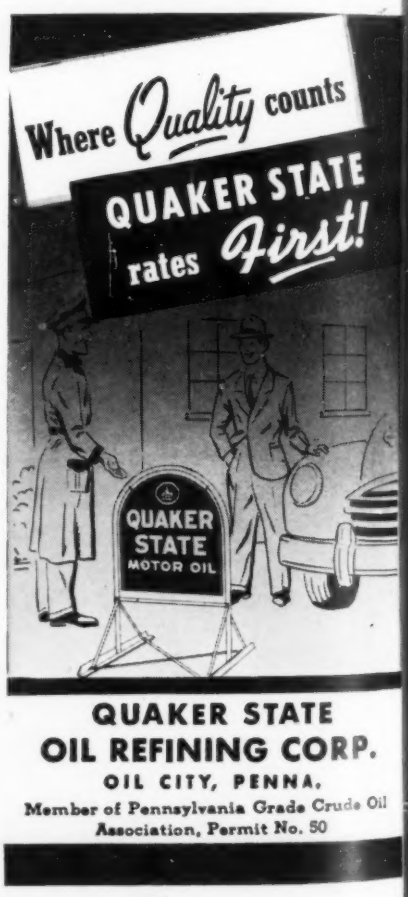
Continued on Page 12



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ook, Sixteen Pages

This issue of "The Institute Spokesman" breaks all records for size; sixteen full pages of interesting reading material and advertisements for the first time in the history of the "Institute Spokesman."

Starting out in March of 1937 "The Institute Spokesman" was multigraphed for the first year of its existence. During the second year a great step forward was made in that each issue was printed and better quality of paper was used. The size remained at four pages.

In 1941 the size was doubled to eight pages where it remained until November of 1946, when a revolutionary change was made in the format of "The Spokesman." The printing matter was taken off of the front page, an attractive cover design with an appropriate picture was substituted, the solid pages of advertising was broken-up and interesting reading matter was placed on every page with a liberal use of pictures to illustrate the articles. Additional items of interest to the lubricating grease manufacturing industry was incorporated with each issue in addition to the technical article which it always contains. The size was increased

Continued on Page 11

ALEMITE

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Institute of Petroleum Report on Lubricating Greases

The following summary report on the work of the Institute of Petroleum on lubricating greases has been prepared by Col. S. J. M. Auld, Chief Technician, Socony-Vacuum Oil Company, Ltd., London, England, who is also Chairman of the Grease Sub-Committee 12 of the Institute of Petroleum. Col. Auld came to the United States last fall to attend the Fourteenth Annual N.L.G.I. Convention in Chicago. Those in attendance had the fine privilege of hearing him discuss "The War and Post War Grease Industry in England" which was reprinted in the January issue of "The Institute Spokesman."

The activity of the Sub-Committee is divided up between three Panels—one dealing with General Tests and the others with Mechanical and Rheological Tests respectively. This sub-division is obviously necessary due to the increasing complexity of both the manufacture and application of lubricating greases themselves; and is similar to the three sections of the A.S.T.M. Technical Committee G.

The work of two of the Panels—Mechanical and Rheological Tests—has been delayed to a certain extent by the present-day difficulty of getting new equipment made or of importing or matching American apparatus on which work has already been carried out and results discussed. Certain types, especially those coming under the "Mechanical" heading, have already appeared in U. S. Specifications and have been considered for the corresponding British ones as, for example, the High Speed Endurance Test. Again, it is obvious that certain other designs, such as the Timken Machine, are common to both lubricating grease and oil, and therefore such work will have to be done on a co-operative basis with the Sub-Committee (No. 5) already in existence.

A more diverse field is that covered by the General Tests Panel whose activities have included the study of test methods for Oil Separation, Drop Point, Oxidation Stability, Foreign Particles, Free Acid and Alkali, Water Absorption, etc., and have produced the first Tentative Method, namely, that for Copper Strip Corrosion. It will be noticed that this partial programme includes several old favourites, particularly the Drop Point and Free Acid determination which is surely an indication that these tests may still be improved.

The scope of the Rheological Tests Panel's work is also large and to a certain extent novel. Work at the present time is concentrated on the study of measurements at low rates of shear and includes the intention of modifying the present Penetration Method as it is felt that the useful range might be extended and the measurement itself become less arbitrary and related to the yield value. The future programme will include measurements at increasing rates of shear as it is felt by the Panel that probably measuring instruments and test methods may ultimately fall under three headings, namely, at low, medium and high shearing rates corresponding to grease in containers, pumps and pipe lines and finally in bearings. Papers covering the rheological testing of greases in general and developed methods in particular are being presented at the annual Conference of the British Rheologists Club to be held in London in October.

At the last meeting of the Sub-Committee itself considerable discussion took place relative to the proposed N.L.G.I. consistency range. The Rheological Panel, who had already debated the matter, presented a report in which the range was rather criticized from the point of view that it still expressed the ranges in the arbitrary units of penetration which the Panel itself is hoping to modify. It was felt that while some such classification could be as useful as, say, the S.A.E.

Continued on Page 11

Swan-Finch Oil Corp.

RCA Building 201 N. Wells St.
New York 20, N. Y. Chicago 6, Ill.

Manufacturers

Lubricating Oils — Greases

Foundry Core Oils

BALL BEARING LUBRICATION *and* HOUSING DESIGN

By H. R. REYNOLDS, Chief Engineer The Fafnir Bearing Company, New Britain, Conn.

About The Author

Harry R. Reynolds, author of the article "Ball Bearing Lubrication and Housing Design," is recognized throughout the anti-friction bearing industry as a leading authority on the subject of grease selection for ball bearings. Early in America's young ball bearing industry he recognized the fact that it was more than necessary to manufacture fine inner and outer rings and balls and assemble them accurately in order to produce long-lived ball bearings. The length of life depended very much on the lubricant with which the bearing was endowed by its maker. To this subject, in addition to his other duties at The Fafnir Bearing Company in New Britain, Conn., Mr. Reynolds has given over three decades of study.

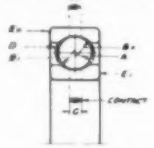
This pioneer in the field of ball bearing lubrication was born in Greenwich, Conn., 62 years ago. After completing his studies in Norwalk High School in 1902 he served as a machinist and draftsman for some years. In 1911 he joined the infant Fafnir Bearing Company, one of the early ball bearing manufacturers in America, to take charge of manufacturing operations. He has remained with Fafnir, much of his time having been devoted to engineering and development.

When he joined Fafnir, almost every worthwhile sale of ball bearings for industrial use involved a missionary job—ball bearings were looked upon as interesting playthings. Little was it realized that industry's demand for them could bring the day when they would be accepted as to be stocked and sold over the counters of distributors like sugar.

To Mr. Reynolds have been issued patents covering important development in ball bearing manufacture such as the invention of the Fafnir transmission bearing, new designs in pillow blocks and hanger boxes, new types of seals to retain lubricant and exclude dirt. He is one of the diminishing group of men still active who were in at the birth of the American ball bearing industry, and nursed it along to its present unchallenged position as world leader.

Why is Lubrication Necessary?

Ball bearings as well as plain bearings require lubrication and, in each case, the purpose of the lubricant is exactly the same; to prevent material break-down from rubbing surfaces in direct contact. All ball bearings designed for heavy loads have race-ways or grooves to guide the balls.

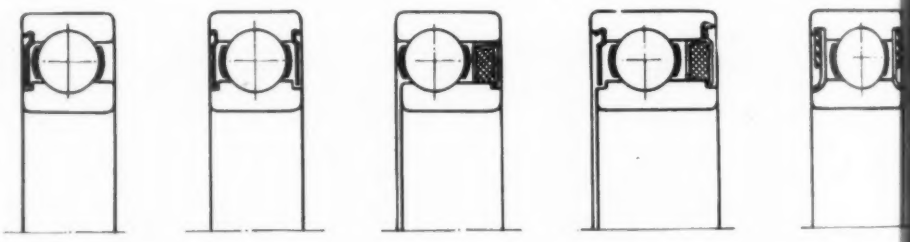


These grooves also serve the purpose of reducing material distortion under higher loads. (Fig. 1)

The closer these race-ways or grooves encircle the balls, the greater the resultant capacity as well as the resultant slippage. This slippage increases with the load since the heavier the load the greater the deformation of the balls and their supporting grooves and the greater the contact area. Lubrication is also necessary between the cage or separator which spaces the balls. Here, as our load, we should have only the weight of the cage divided between the number of balls, but bearing applications are seldom perfect and cage loads are quite often very high.

Ball Bearing Types.

The ball bearing industry has developed a number of different types to suit various customer requirements. We will restrict our remarks to the radial bearings as the purely thrust type have the same lubrication requirements.



Radial ball bearings are made in Single Row, Double Row, Single Row Shielded, Single Row Sealed and Double Row Shielded types. Shields are simple baffles but seals vary all the way from simple felt members to elaborate combinations of slingers and contact materials. (Figs. 2, 3, 4, 5 and 6.)

Shielded and sealed bearings are available with one side or both sides of the ball bearing protected and are generally

The shield in a ball bearing was originally developed as a baffle between the lubricant in the housing and the rotating balls. Its purpose was to meter the grease slowly into the bearing from an adjacent supply. Today the majority of shielded bearings are used where the shield acts to retain the lubricant with which the bearing is packed by the maker and also to prevent the entrance of outside contamination. (Fig. 7)

The seal in a ball bearing was developed to seal in the original lubricant and seal out dirt, dust and other foreign material. The modern sealed bearing is very successful at both functions.

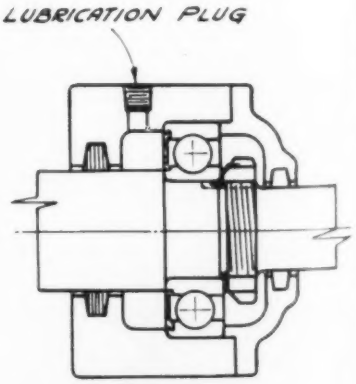


Figure 7

Mr. H. R. Reynolds, using the blackboard to illustrate some points as he read this paper before the fourteenth annual N.L.G.I. convention at the Edgewater Beach Hotel in Chicago, September 30-October 2, 1946.

prelubricated by the manufacturer.

Housed Bearings

Today an increasing number of manufacturers are supplying ball bearings completely housed and, in most cases, the housing designs permit of relubrication. These applications are generally sold through jobbers and the original maker seldom knows under what conditions of service they will perform. The majority of these complete applications are designed to meet a competitive market and, while satisfactory for normal conditions, they require additional features for extremes of temperature or excess of dirt or moisture. This is especially true of their lubrication. (Fig. 8)

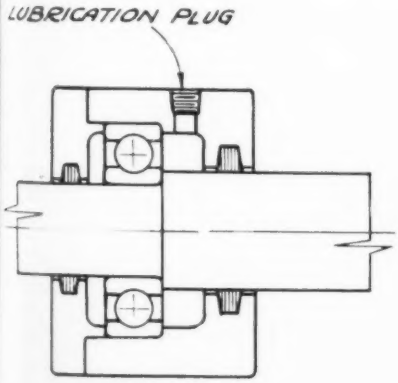


Figure 8

What Happens To Grease In a Ball Bearing?

Ball Bearings when operating, subject their lubricant to considerable churning. If the speed is at all high, this churning develops heat which is a factor of the amount of lubricant, its consistency and the speed of the bearing.

The heat developed by churning does strange things to some lubricants and our early experience with these results was the beginning of our individual checking of greases for our own and our customers' information and protection.

What We Expect of a Grease Lubricant

In order to lubricate a ball bearing satisfactorily, a grease must resist mechanical break-down from the combination of churning and heat present in a ball bearing application. Consequently, one of our first checks of a lubricant is for mechanical stability. We use the ABEC machine for this purpose, and three runs at three different temperatures tell us if the sample is good enough for further investigation. The next check is to establish comparative age life, which we term chemical stability. The apparatus employed is the Norma-Hoffmann Bomb and the results provide a guide to expected age life in service.

Another important requirement is temperature range. Again, the results are comparative. Here for normal use we check between minus 40 °F and +220 °F. In general, we do not recommend any grease for continuous service at temperatures above 175 °F.

We also check for dirty material since, while we carefully filter all lubricants supplied by us, many times we are asked to recommend greases to customers for relubrication. Very few customers have the necessary filtering equipment.

Still another subject of our investigation is the noise level of greases otherwise acceptable. Some greases churned by a ball bearing either don't like it and complain by screeching or else they do like it and rejoice by singing. Whichever it is, most of our customers are noise conscious and quick complaint follows any noise regardless of its quality.

A grease selected by us is not picked because it meets a specification. We believe we know what a good ball bearing grease should do and by comparative tests, we select the materials which meet best our requirements. For extremes of temperature, speed, moisture and dirt, not only is the lubrication specially handled, but housing design is also a very important consideration.

The Lubrication of the Ball Bearing

Prelubrication — Today a large percentage of all ball bearing production is prelubricated. Prelubricated bearings are the responsibility of the maker. Regardless of who buys them or how or where they are to be used, the original supply of lubricant in a prelubricated bearing is all there is or is ever going to be. Obviously, the grease used for prelubrication must be very carefully selected. The space left

Continued on Next Page

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for lubricants in even the larger bearings is very small. The shields are not especially effective in keeping grease in or dirt out, and even built-in seals have their limitations. Service conditions are generally unknown when the bearing is lubricated, also the time lapse between packing and use may be a year or more. Therefore, greases for prelubrication must have excellent mechanical and storage stability. They must also have a long temperature range and their ability to lubricate continuously regardless of outside conditions must be outstanding.

To influence a bearing maker to change his preferred prelubricating material, the grease manufacturer must first prove his material is superior to all materials previously tested and then be prepared to wait several years while his product is proved in use. Even then only a series of complaints from ball bearing users will throw out a material of several years satisfactory service.

Where the standard grease fails to meet all the customers' requirements, then be sure we are ready to investigate all materials available and, in fact, probably have already done so.

For special combinations of temperature, humidity or other abnormal conditions, no general purpose grease will serve as well as one especially selected for the particular purpose, but in general it will come very close.

Relubrication—The ball bearing maker hasn't much control over greases used for relubrication. In fact, he seldom has any knowledge of the bearing housing design or the arrangements for lubrication. In the majority of applications, the selection of the proper grease is just as important as for prelubricated applications. This is true because there are no facilities provided for applying the grease other than a standard grease fitting and a hole from the fitting to the inside of the bearing housing. There are no special features to insure that the grease will reach the bearing unless the housing voids are completely filled. Also, there is no provision for venting off surplus grease except past the seals. (Fig. 8)

Such a housing is really a duplication of a prelubricated bearing except for the regreasing hazard. It is this design of application that sets up most of the problems raised by the bearing user in connection with ball bearing regreasing. How much, how often, and with what, are the questions usually asked.

If the customer or user was sure of getting a grease equal to that used by the bearing maker for prelubrication, he could take care of his problem nicely by over-filling, allowing the surplus to vent (it will anyway) and then cleaning up and forgetting the application for the next couple of years. One of our well-known motor builders recommended this practice—their ball bearing motor relubricating instructions called for removing the covers once a year and cleaning and repacking at that time. It is quite possible that some of these motors were never regreased as in all probability they were installed in inaccessible positions. A more modern approach is now advertised by one of the leading motor manufacturers who advertise that his ball bearing

Continued on Page 8

STEEL SHIPPING CONTAINERS
STEEL PAILS AND CANS
All Sizes—All Styles
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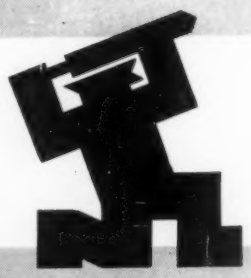

Penola Inc.
26 BROADWAY, NEW YORK 4, N. Y.

NEW ADVERTISERS . . .

Have you noticed the growing list of new advertisers whose sales message is appearing on the pages of "The Spokesman?"

Starting with the November issue which was the first one with the change in format, we have welcomed these firms as advertisers and now wish to give them this official recognition:

Mooney Chemicals, Inc., of Cleveland have carried a half page ad in November and in every issue since. We have come to look upon them as "old timers."

The International Lubricants Corporation of New Orleans started the New Year right with a half page ad in the January issue and a contract for that same space for all of 1947.

Mr. Harry Canine of Chicago has a half page in the January issue which will continue through the year. (He abbreviates his name thusly: HK9.)

The Votator Division of the Gidley Corporation increased their usual half page to a full page for both the December and January issues.

In this February issue we see three more new faces: Battenfeld Grease and Oil Co. of Kansas City and the Gulf Oil Corporation of Pittsburgh each with a half page and the Farval Corporation with a one-twelfth page space, which will continue through 1947.

Welcome, gentlemen, to the columns of "The Spokesman" and may your tribe increase!

In paying this tribute to the "newcomers" we are mindful of the "regulars" whose advertising has been a part of every issue for a long time and our indebtedness to them for their splendid support.

All of these new faces indicate clearly that advertisers are recognizing the value of "The Institute Spokesman" as a good avenue for their sales message. It offers these advantages: a limited number of ads in each issue which cuts your competition to a minimum, the circulation is very selective representing a concentrated group keenly interested in lubricating greases, there are no solid pages of advertising. Reading matter of interest is placed on every page which draws the reader's attention to your advertising message. Files of "The Institute Spokesman" are kept by individual, company, college, and technical libraries for frequent reference.

Special Delivery to Every Bearing!

Farval—the Dualine System with the Positive Piston Displacement Valve — that has but 2 Moving Parts—is Fully Adjustable—and with a Telltale at each bearing to show the job is done.

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FARVAL
CENTRALIZED SYSTEMS OF LUBRICATION

A Complete GULF *Line of . . .*

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Pittsburgh, Pa.—Toledo, O.—Cincinnati, O.
Port Arthur, Tex.—Fort Worth, Tex.
Sweetwater, Tex.

Ball Bearing Lubrication and Housing Design

Continued from Page 6

equipped motors require relubrication only once in five years.

With greases carefully selected from those now available, this can be done quite safely. The motor in question uses what we call a prelubricated housing. It is just as practicable as a prelubricated ball bearing. Using any of the better known lubricants developed for ball bearing use in a temperature range from about minus 15°F. to plus 175°F., with speeds up to 3600 r.p.m. and a shaft not over two to three inches in diameter, the relubrication period can be any convenient period varying from three to ten years under favorable conditions.

The advantage of the prelubricated housing over the prelubricated bearing lies in the fact that the housing can be cleaned and relubricated while the majority of prelubricated bearings cannot be relubricated. There are a few types which can be, but the operation is not conveniently accomplished. As a result, prelubricated bearing life is determined by the effective life of the lubricant. In a prelubricated bearing housing, however, if careful attention is given to the condition of the grease at stated periods, a lubricating schedule can be set up which will insure the minimum of attention with indefinite life as far as failure of the bearing from scant lubrication is concerned.

Of course, the better the housing design from the relubricating standpoint, the easier it is to inspect and determine the relubricating periods.

Housing Design

Ball bearings are quite frequently designed into machinery without giving much consideration to their lubrication requirements. When trouble develops from faulty lubrication and the bearing engineers investigate, they are apt to find that either the grease is unsuitable, which is perhaps the less frequently recurring condition, or that the housing is wrongly designed. This latter is the most common fault encountered. Faulty housings usually fall into one of the following classes:

(a) Housings with grease channels so long and of such small diameter that a hand gun builds up stalling pressure but delivers no grease. The same thing happens if holes are drilled at angles to one another. The cure, of course, is to increase the size of the grease channels.

(b) Housings equipped with tight fitting seals. Commercial seals are available which seal so tightly that pressure builds up and prevents grease entering in sufficient quantity to reach the ball bearing. The cure is to supply a vent at some convenient position.

(c) Two bearings well spaced in a common housing with one grease fitting outside of one bearing. Such an application is like blowing into a bottle. If possible, a second grease fitting should be provided near the second bearing. Sometimes this cannot be done conveniently and the answer is to select a soft grease which will level off and finally reach the inside bearing.

(d) Application point and vent on same side of housing in horizontal applications. This is very much like a housing without a vent and requires a grease which is soft enough to level off or else enough must be applied to nearly fill the space between bearing and side wall to insure that some of it will work into the bearing. (Fig. 9)

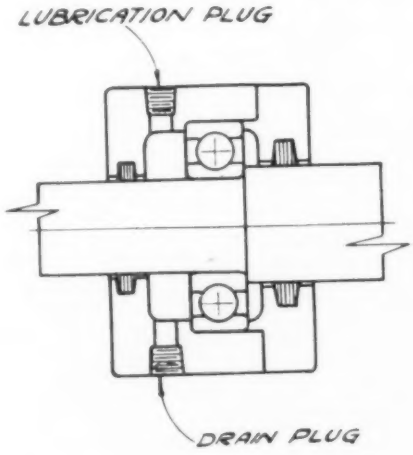

Figure 9

(e) Application point well below bearing in vertical applications. The cure in this case is to either move the application point or fill completely. (Fig. 10)

(f) When housings are poorly sealed not much can be done short of

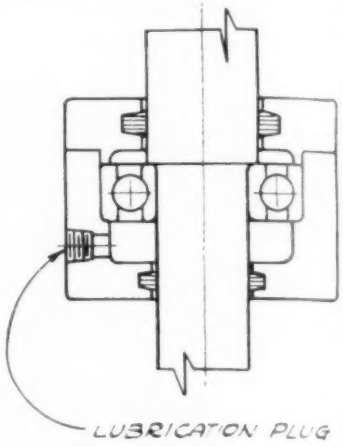

Figure 10

major operation, but hard grease should be used or leakage will be excessive.

(g) Wet applications with inadequate seals. The best thing to do in such cases is develop satisfactory sealing. The only thing possible otherwise is generally the selection of a wate

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resistant grease and learning to love the trouble.

(h) Grease selected will not meet the temperature conditions. The proper grease can generally be suggested unless the temperature range is too great.

(i) Use of the wrong bearing. This is as bad as housing design and can seldom be changed. This, of course, is not a lubrication question.

We have already described the type of housing most commonly encountered. (Fig. 8) It is equipped with a grease application point but no provision is made for venting except past the seals. With a good grease and good guessing this gives fair results but, we repeat, all the questions of how much and how often, center around this application. The operator can't possibly know how much grease is already inside so his only course is to fill until the grease begins to escape past the seals or else guess at the amount to be applied and hope. If he does over-fill, and there is much speed, temperature will build up. Temperature causes expansion. It also tends to melt the grease which increases the trouble as between the softening of the grease and the pressure built up, considerable grease will escape past the seals. The operator noticing this condition feels that his bearings need more grease. He is apt to supply it generously, and the cycle repeats itself.

A better housing design would incorporate a vent as well as an application point, but the position of the vent is important. (Fig. 9)

There are many applications of ball bearings where the application point of the grease and the vent are on the same side of the ball bearing. Instructions for lubricating such applications say, "Remove vent plug and fill until grease begins to come out of vent. Run the unit a few minutes until venting stops, then replace vent plug." This is much better than the housing with application point only, but unless the grease is fairly soft, the housing may be over-filled and still the bearing gets very litle grease. If the housing is sufficiently filled to force some grease through the bearing and into the adjacent space, then we will have a surplus collecting here and troubles from aged grease will follow. This design is better as it can be flushed out and old greases dissolved with solvents but, in general, the same care in grease selection is required as already described for a housing with an application point only. Our preferred design is old and has been a standard with at least two of our electric

Continued on Next Page

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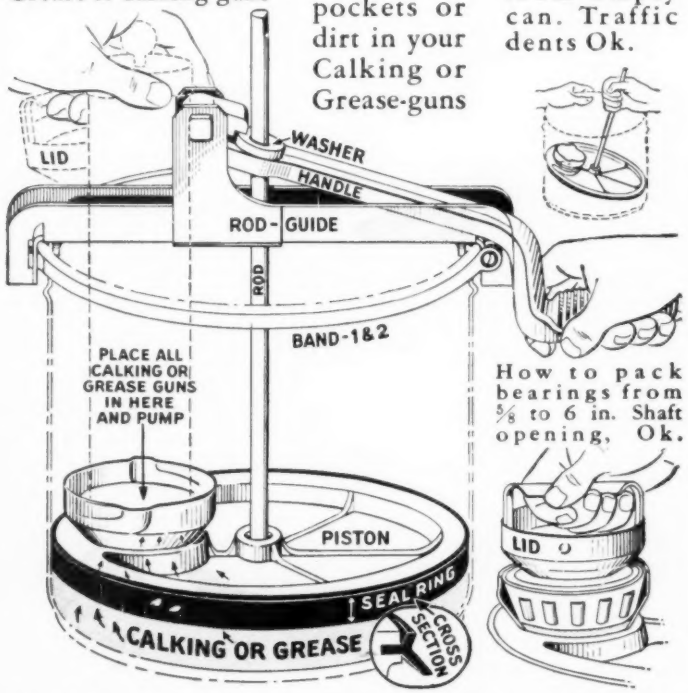

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motor builders for many years. It should be adopted more often by all users of ball bearings. It permits the user to select the better greases and have all the advantages of long periods between greasing, it also makes all the grease applied pass into and through the ball bearing and, since it provides a sump into which the surplus can vent, there is very litle trouble from over greasing. This design supplies the grease from a point closely adjacent to the face of the ball bearing on one side. The interior of the bearing housing on this side is shaped to direct the grease into the bearing so that even the smallest amount reaches to the points where it will do the most good. (Fig. 11)

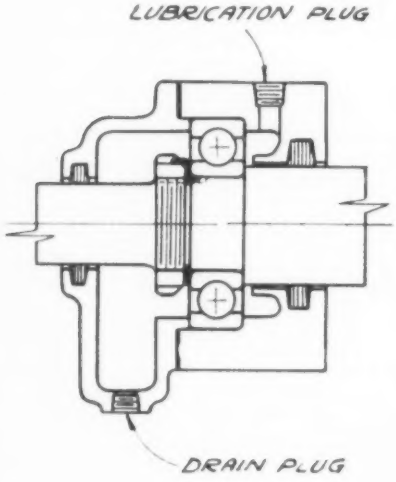

Figure 11

On the opposite side of the ball bearing, ample space is provided for the bearing to eject excess grease. This space should be in the form of a well if conditions permit. This takes care of the question of how much. In a way, it also takes care of the question of what grease should be used since any good lubricant will lubricate a ball bearing. Our troubles start when good lubricants go through a change of life and become something else. Each addition of new grease tends to force out the old grease thus making it possible to use many good materials which ordinarily would be ruled out because of their short life. Most all greases would serve between average periods of relubrication, say from three months to not more than one year.

In addition to proper design for ideal grease lubrication, we must also add a few words regarding proper sealing. Many bearing failures are blamed on poor lubrication which are entirely the fault of inefficient seals. Temperature, moisture, fast moving air or any of several other conditions may remove the lubricant, contaminate it, or change it entirely. All these conditions must be met by proper housing design and the incorporation of proper seals. Where the design engineer has given careful thought to the problem, lubrication becomes much more simple, the selection of the right grease less complicated and the amount and time interval easily established.

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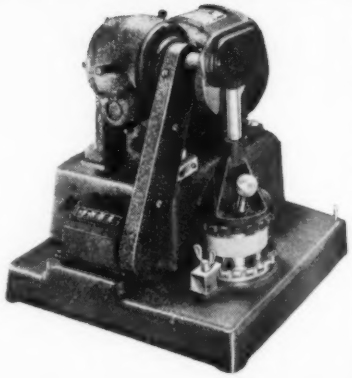

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Institute of Petroleum Report on Lubricating Greases

Continued from Page 3

numbers for oil, it would be preferable if the measurement were more fundamental.

In general discussion certain minor criticisms were made. It was noted that the No. 0 is actually outside the limits of the present I.P. test method where softest grease permitted is one of 350 units. Most of the other criticism was from the point of view of the actual ranges both in definition and number. War-time experience of at least one English company suggests that probably four only are necessary. As to actual definition, it was generally felt that limits should be reduced as the grease became stiffer, following the usual British method. For example, the spread of 85—115 points for No. 6 is so wide as to be almost useless. In conclusion it can be said that general interest was shown, and subject to agreement of actual figures would put the idea forward for discussion by the appropriate committee of the B. S. I.

S. J. M. AULD, Chairman
Grease Sub-Committee,
Institute of Petroleum,
London, England.

Look—16 Pages

Continued from Page 3

to twelve pages.

With this issue the size is again increased in order that we may accommodate the wealth of material of vital interest to the industry. There are two technical articles and items of great interest in addition to the increased amount of advertising that is being sent to us.

The growth in the size and quality of "The Institute Spokesman" is keeping pace with the growing importance of the lubricating grease manufacturing industry in its close relationship to the industrial and economic life of the world and the National Lubricating Grease Institute which incorporates in its membership approximately ninety-five per cent of the industry.

More New Members For the Institute

To Active Membership in the N.L.G.I. we welcome the Patron Oil Company, Ltd., with offices in the Dominion Bank Building at Moose Jaw, Saskatchewan, Canada. The company operates wholly in the province of Saskatchewan, owns 32 bulk stations and approximately 250 dealer outlets which makes it the largest independent operator in the province. Mr. William Jeffrey has been the manager of the company for seventeen years.

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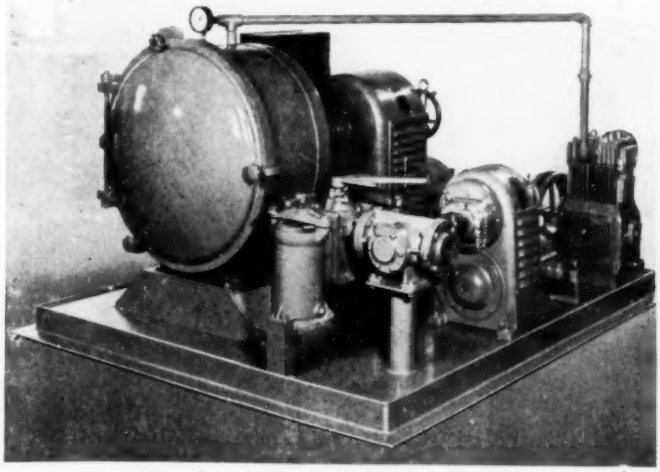

Grease Homogenizer, showing feed pumps, strainers and vacuum pump.

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When the Headquarters of the National Lubricating Grease Institute was moved from Buffalo to Kansas City it was necessary to occupy temporary headquarters in the Land Bank Building. During the intervening months we have negotiated with building owners and managers for desirable office space and have finally been very fortunate in locating a suite in the business district of the Country Club Plaza section which is one of the show places of Kansas City and a model of city planning and beautification. It is centrally located to the petroleum industry here in Kansas City with the main offices of Skelly, Standard Oil, Battenfeld, and others close by, easily accessible to bus and street car and in a location befitting the dignity and importance of the Institute.

After February the first please address all of your correspondence to:

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We will be glad to have you visit us in our new quarters if business or pleasure brings you to Kansas City.

President Hobart Appoints N.L.G.I. Committees For the Year

Continued from Page 2

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G. A. Olsen, Sunland Ref. Co., East and Calif. Ave., Fresno 16, Calif.

O. J. Schierholtz, Ontario Research Foundation, 43 Queens Park, Toronto 5, Ontario, Canada

John Papple, H. K. Stahl Co., 2314 Wycliffe St., St. Paul, Minn.

N. C. Penfold, Armour Research Foundation, 35 West 33rd St., Chicago, Illinois

T. G. Roehner, Socony-Vacuum Oil Co., Inc., 412 Greenpoint Ave., Brooklyn, N. Y.

F. J. Sanders, Standard Oil Co. of Ohio, 5703 Hamlet St., Cleveland, Ohio

W. H. Saunders, Jr., International Lubricant Corp., P.O. Box 390, New Orleans, La.

H. O. Smith, Annular Bearing Engineers Committee, Rm. 2825, 60 E. 42nd St., New York 17, N. Y.

R. N. Smith, McColl-Frontenac Oil Co., Ltd., Yardley House, Toronto, Ont., Can.

L. W. Sproule, Imperial Oil Company, Sarnia, Ontario, Canada

C. I. Kraus, Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Illinois

J. B. Stucker, Pure Oil Company, Research Lab., Winnetka, Illinois

B. G. Symon, Shell Oil Company, Lub. Dept., 50 W. 50th St., New York, N. Y.

Norman Thompson, Sun Oil Co., Marcus Hook, Pennsylvania

C. B. Veal, Coordinating Research Council, 30 Rockefeller Plaza, New York, N. Y.

B. C. Voshell, Socony-Vacuum Oil Co., 26 Broadway, New York, N. Y.

L. C. Welch, Standard Oil Co., 910 South Michigan, Chicago, Illincis

R. M. Welker, Gulf Oil Corp., Gulf Building, Pittsburgh, Pa.

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Date and Place Set for N.L.G.I. Fifteenth Annual Convention

The Institute's Board of Directors have designated Chicago, Illinois, as the place for the Fifteenth Annual Convention. They have chosen the dates of October the 16th, 17th, and 18th and the Edgewater Beach Hotel in the 5300 block on Sheridan Road will be the convention headquarters where all of the meetings will be held.

In making this decision the Board of Directors gave careful consideration to the invitations that have been extended by other cities through their Convention and Visitors Bureaus and Hotel Associations for the 1947 N.L.G.I. Convention. They were influenced in making their final decision in favor of Chicago by its central location which makes it accessible to members of the industry from all over the United States and Canada with a minimum of travel, by our previous satisfactory experience in holding N.L.G.I. conventions in Chicago at the Edgewater Beach Hotel and by the fact that these conventions had been well-attended in Chicago and, therefore, there was every reason to expect that this fine attendance would have not only be maintained in 1947, but greatly increased because of the enlarged membership of the Institute itself and the greatly augmented program of activities and accomplishments.

The Program Committee under the capable chairmanship of Mr. J. R. Corbett of the Cato Oil and Grease Company, Oklahoma City, is already at work developing and building an interesting program. Outstanding speakers, authorities in their respective fields, are being invited to prepare and deliver papers at this convention and every effort will be made to have preprints of every paper delivered before the convention available for distribution.

While definite announcements will be made later, it is tentatively planned to have a symposium on the third day of the convention under the direction of the Technical Committee. A timely and interesting subject has already been virtually agreed upon. There will be a cocktail hour and banquet as in previous years. Meeting rooms have already been contracted for with the Edgewater Beach Hotel and a larger allocation of rooms for the convention delegates have been set aside in anticipation of an increased attendance.

N.L.G.I. Executive Committee Meets In Chicago

Mr. B. C. Voshell of the Socony-Vacuum Oil Company of New York City called together the members of his Executive Committee for a one day meeting at the Blackstone Hotel in Chicago, Illinois, January the 16th. A heavy agenda required the full day of those in attendance. Many items of immediate and future importance to the Institute's program were discussed at length and recommendations to the Board of Directors concerning plans and policies were made.

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RAPID METHOD FOR DETERMINATION OF OIL IN LUBRICATING GREASES . . .

C. J. Boner, Chief Research Chemist and G. A. Williams, Chief Control Chemist of the Battenfeld Grease and Oil Corporation, Kansas City, Missouri

About the Authors

Glenn Williams was apparently born on a farm in a small Welsh community in Ohio between Akron and Youngstown. The lack of official records with the consequent lack of birth certificate, however, proved embarrassing in his contacts with Canadian immigration officials in traveling to Toronto during his graduate work. These officials seemed to entertain some doubts that he actually was born at all, which accounts for the "apparently" in the first sentence.

The B. F. Goodrich Rubber Company at Akron introduced him to industry; and a dusky and odorous introduction it proved to be, for the work included such intimate acquaintances as Carbon Black, Xanthogenates and Acrylic Aldehyde.

The next move carried an introduction to the somewhat less objectionable odors used in the manufacture of perfumes and cosmetics. These odors were eventually replaced by the more robust odors of grease-making materials, and for the last ten years Glenn has been associated with the Battenfeld Grease & Oil Corp. of Kansas City.

Glenn A. Williams as he delivered this paper before the 14th Annual N.L.G.I. Convention in Chicago, September 30th, 1946.

During this time his interest has not been entirely on lubricating greases but has been divided with the flowers he raises in his suburban home and the all too few hunting and fishing excursions which both he and his wife enjoy.

C. J. Boner received his degree in Chemical Engineering from the University of Missouri. Following graduation he was employed in high explosive manufacture by DuPont for a number of years.

He then became consultant to two smaller explosive manufacturers and thereafter, manager of operations for Union Explosive Company. This firm was taken over by one of the large explosive manufacturers causing the writer to seek other fields.

This took the form of a job with the Battenfeld Grease & Oil Corp., which has continued for twenty years. During the latter half of this time Mr. Boner has devoted the major portion of his time to Research and Development.

He has published a number of papers on Lubricating Greases and Metallic Soaps, the latest of which is a chapter on "Lubricating Greases as Colloidal Systems" in Volume VI of Colloid Chemistry, edited by Jerome Alexander.

Mr. Boner is particularly active in the affairs of the American Chemical Society, having served as Chairman of the Kansas City Section.

Some years ago, our technical organization found through much use, that the standard method of the American Society for Testing Materials (D-128-37) for analysis of lubricating greases had shortcomings particularly in the quick determination of oil content. In 1938, that led us to prepare a paper, entitled "RAPID METHODS FOR DETERMINATION OF OIL IN LUBRICATING GREASES" which was presented at the sixth annual meeting of the National Lubricating Grease Institute.

That paper described methods for breaking down several types of lubricating greases, and obtaining oil, so the viscosity could be determined. The whole operation could be completed in about an hour, which permitted the checking of the oil viscosity of the finished lubricating grease while still in process, and before it was filled into the final packages. The ASTM Standard Method usually requires the greatest part of a day, so this represented a considerable saving in time. In case of lubricating greases made to close specifications, it sometimes saved the cost of rejecting a batch which was found to be outside the oil viscosity limits. That paper also reported the effect of various fats, fatty acids, lime, sodium hydroxide, and water on the viscosity determination. However, under the conditions described in this Rapid Method, it is planned to have an excess alkali present; consequently, any free fats or fatty acids should be completely saponified during the heating operation, and none should be present in the separated oil to influence the viscosity determination.

Since our original paper, much water has passed under the bridge, and this paper presents refinements of our method which have been developed. The time required for determination of penetration and oil viscosity on a batch of lubricating grease in process has been reduced from an hour to about thirty minutes or less. This has been made possible in part by the adoption of the Kinematic Viscosimeter which requires only a small quantity of oil and, in part, by improved skill of the operators.

We still find considerable variation in the ease with which various lubricating greases break down and release their oil. There is also a considerable variation between types of oils. Calcium base products usually are the easiest, and aluminum base the most difficult to handle. Low viscosity paraffin oils come out much easier than high viscosity naphthenic or asphaltic oils. Soft consistency greases break down much easier than the harder grades containing more soap.

Where we find a particularly difficult separation, we usually start with larger quantities, and plan to add a second por-

n of the alkaline material after the has been separated from the major rtion of the soap. This second addition alkali usually brings out the remainder the soap and gives a clean oil.

There are certain precautions which uld be mentioned:

1. Quick heating is absolutely necessary.
2. In case of low flash oils, the operator must be careful not to overheat and drive off the lighter portion, which would give a misleading high viscosity.
3. If too large an excess of alkali is added, it remains in the finished oil as a cloud, and is difficult to remove. Thus, it is often faster to discard the oil and start another determination.

In handling a calcium base grease, our operators place ¼ to ½-pound of it in a 3-quart metal pan, add about a half-ounce of dry lime, stir the lime into the grease, heat until most of the water is gone and then set the pan in cold water; if the lubricating grease is not heavier than a No. 3 N.L.G.I. and the oil viscosity is not above 100 at 210°F, clear oil will separate out in a few minutes. This oil is filtered through a closely-knit cloth to make certain all particles of soap are removed, and it is ready for the viscosimeter. If the product is heavier than a No. 3 N.L.G.I., or the oil is very heavy —as the mass cools after drying out the water, some working with a stiff spatula may be desirable to assist in the oil separation. With a No. 2 N.L.G.I. Cup Grease containing a low viscosity oil, the viscosity determination should be completed in 20 minutes. As the operator becomes acquainted with the method, the proper dryness to quickly get clear oil becomes quite apparent.

If the grease is made from fatty acid, the soap will usually not separate well, but the addition of 5 to 10 ml. of glycerine will give a dough-like mixture, from which oil will readily separate. Sometimes, a little working is necessary.

In a few cases, the soap cools into coarse granules resembling sand, and the oil does not separate. Careful reheating until the soap begins to soften, and then working it with a stiff spatula will cause the oil to separate.

As an operator becomes more familiar with this scheme for breaking down lubricating greases, the appearance of the mass during heating and cooling gives certain indications, and slight variations are developed to save time until each individual product eventually becomes a slightly different procedure.

In separating the oil from a sodium base lubricating grease, we originally depended upon extracting the soap with water. If the oil is of relatively low viscosity, and results are not urgently

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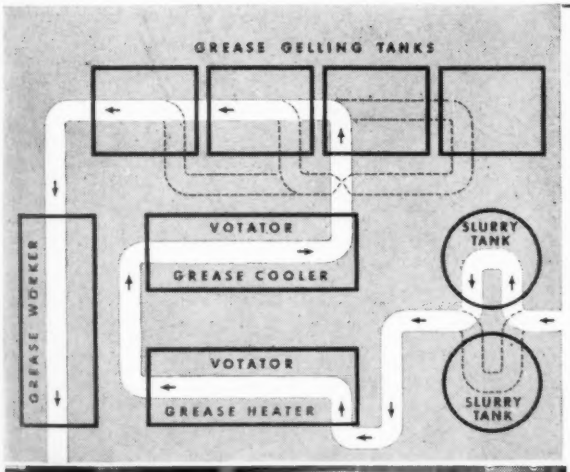

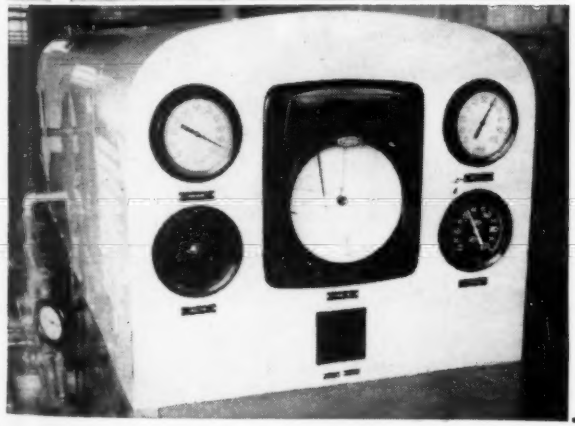

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Typical flow diagram of continuous, closed VOTATOR process, for aluminum stearate grease, and closeup of VOTATOR grease heater.

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needed, we still place the lubricating grease in hot water and skim the oil off the surface as soon as there is a sufficient quantity. After filtering through several thicknesses of dry cloth to remove traces of water, the oil is ready for the viscosimeter.

However, if time is important, we stir about ½ ounce of caprylic acid* into about ½ pound of grease, and heat, and stir until almost completely liquid (usually about 250°F.) Add about one ounce of lime or 1½ ounce Barium Hydroxide, stir and heat until most of the water has been driven off, cool, filter the separated oil through a cloth, and it is ready for determination of viscosity.

Barium lubricating greases respond well to this method. One-half ounce of caprylic acid is stirred into about ½-pound of grease while heating to 320°F with good ventilation. The container is then removed from the heat, and 1½ ounces of Barium Hydrate added. Considerable frothing results, and care is required to prevent boiling over. Heat carefully until most of the water has been driven off, cool, and filter the clear separated oil through a cloth.

Lithium greases often require a little glycerine in addition to the procedure given for ba ium. Where lithium greases contain low flash oils, care must be exercised in heating, both because of the fire hazard and the possibility of losing the lighter portion of the oils.

Aluminum base lubricating greases respond a little less readily than others, and a slight variation has been necessary. To 300 g of the grease, add 5 to 10 ml. glycerine, 30 ml. of caprylic acid, and stir until melted (about 250°F.) Add two ounces of Barium Hydrate and continue heating. After cooling, filter the separated oil through a cloth and it is usually ready for the viscosimeter. Occasionally, it is quite apparent the separated oil still contains soap and heating with about ½-ounce of Barium Hydrate is necessary, before final filtering.

Conclusion: This scheme of breaking down lubricating greases by the addition of suitable alkali and heat generally gives oil for determining viscosity in less than half an hour, and is much simpler to operate than the Standard ASTM Method.

While it does not give a quantitative measure of the amount of oil in the lubricating greases, the resulting oil not darkened by the operation. Our experience during the last nine years has proven that this method of determining oil in lubricating greases gives results which check well with those obtained by the Standard ASTM Method D-12 37. It has proven invaluable in our control operations.

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*Obtainable from Armour and Compa at Chicago, Illinois.

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